Journal of the Society of Arts.

FRIDAY, AUGUST 17, 1855.

MEETING OF COUNCIL.

WEDNESDAY, 15TH AUGUST, 1855.

The following Institutions have been taken into Union since the last announcement:—

397. Burton-upon-Trent, Literary Society.
398. Stafford, Mechanics' Institution.

SOCIETY'S VISIT TO PARIS.

The Secretary, having returned from Paris, is enabled to announce that arrangements have been made for the presentation from the Society of addresses to His Imperial Majesty the Emperor of the French, and also the Prince Napoleon, the President of the Imperial Commission. The Imperial Commision will invite the members of the Society, during their stay, to an evening reception at the Palais de l'Industrie; and the public authorities have expressed themselves as most desirous of giving every facility to the Society for visiting public places in Paris and its neighbourhood, and also of doing everything in their power to render the Society's visit agreeable and profitable.

The Secretary has much pleasure in announcing that the French Consul has, in the most handsome manner, signified the intention of his Government to issue passports to the Members of the Society without any charge whatever.

The Secretary regrets that he has been unable to secure any reduction in the fares on the Boulogne and Folkestone, and Dover and Calais routes, as the South-Eastern Company had led him to expect, they alleging as a reason that the Directors of the Northern of France will not agree to any reduction in their fares. These fares, therefore, remain as hitherto, £4 10s. first class, and £3 5s. for second-class return tickets to Paris and back.

The other routes available for visiting Paris, with their respective fares, are as follows:—

BRIGHTON RAILWAY (Newhaven, Dieppe, and Rouen Route).—Times of starting, every day to suit the tide. Return tickets to Paris and back, available for 15 days, £2 8s. first class, and £1 12s. second class. Single journey through tickets to Paris, £1 8s. first-class, and £1 second class.

SOUTH-WESTERN RAILWAY (Southampton, Havre, and Rouen Route).—Return tickets to Paris and back, available for 15 days, £2 8s. first-class, and £1 12s. second-class. Single journey through tickets to Paris, £1 8s. first-class, and £1 second-class. The single journey ticket is available for four days, enabling the bearer to break the journey at different places on the route. This service is performed four days in the week only, namely, Monday, Wednesday, Friday, and Saturday.

GENERAL STEAM NAVIGATION COMPANY'S BOATS FROM LONDON BRIDGE (Boulogne and Calais Route).—Return tickets to Paris and back, available for 15 days, £2 8s. chief cabin and first-class railway, £2 chief cabin and second-class railway, and £1 12s. fore cabin and second-class railway. Single journey ticket, £1 8s., chief cabin and first-class railway, £1 4s. chief cabin and second-class railway, and £1 fore-cabin and second-class railway. This service is performed four times in the week only, namely, Sunday, Tuesday, Wednesday, and Friday.

TILBURY ROUTE.—Eastern Counties Railway, Fenchurch-street Terminus, to Tilbury, and thence by Commercial Company's boats to Boulogne, and by rail to Paris. Return tickets to Paris and back, £2 8s. first class, and £1 12s. second class, available for fifteen days. Single journey through tickets to Paris, £1 8s. first class, and £1 second class.

DUNKIRK, LILLE, AND PARIS.—General Screw Steam Shipping Company, from Irongate Wharf. To Dunkirk, 10s. first class, 7s. second class; Lille 13s., 11s., and 9s., according to class. Single journey through tickets to Paris, £1 8s. first class, and £1 second class.

The return tickets and through tickets by the General Steam Navigation Company's route cannot be obtained on board the boat, but must be taken at the Company's offices, 71, Lombard-street, or 37, Regent Circus, London, or 13, Rue de la Paix, Paris. Members will observe that there is very little saving in taking return tickets, over two single journey through tickets, and that by adopting the latter, the traveller has the option of going and returning by two different routes.

As many persons have been proposed as members, and owing to their being no meetings of the Society cannot be balloted for until the commencement of the Session in November next, it has been determined, in order to prevent disappointment, that all persons duly proposed shall at once be entitled to the general Privileges of a Member on payment of their first year's subscription.

The following list of hotels is given for the convenience of members proposing to visit Paris.

They have been divided into three classes, viz., 1st, Those in the more fashionable quarter; 2nd, Those in the neighbourhood of the Bourse and commercial houses; and, 3rd, Those on the south side of the river.

Members are strongly advised to write to Paris and secure their accommodation one week at least before their arrival in Paris.

HOTELS IN THE MORE FASHIONABLE QUARTER.

Hotel de l'Amirauté, Rue Neuve St. Augustin, 55.
Hotel Bedford (Lawson's), Rue de l'Arcade
Hotel Brighton, Rue de Rivoli.
Hotel Bristol, Place Vendôme, 5.
Hotel Canterbury, Rue de la Paix.
Hotel Choiseul, Rue St. Honoré.
Hotel Douvres, Rue de la Paix.
Hotel de l'Empire, Rue Neuve St. Augustin.
Hotel des Etrangers, Rue Vivienne, 3.
Hotel de France, Rue St. Honoré.
Maison de Goest, Rue Neuve St. Augustin, 46.
Hotel de Lille et d'Albion, Rue St. Honoré, 323.
Hotel Meurice, Rue de Rivoli, 42.
Hotel d'Orient, Rue Neuve St. Augustin.
Hotel d'Oxford et Cambridge, Rue d'Alger.
Hotel de Paris, Rue Richelieu, 99.
Hotel des Princes, Rue Richelieu, 97.
Hotel de Rastadt, Rue Neuve St. Augustin.
Hotel du Rhin, Place Vendôme, 4.
Hotel Rivoli, Rue de Rivoli, 24.
Hotel Sinet, Rue St. Honoré.
Hotel de la Terrasse, Rue de Rivoli.
Hotel Wagram, Rue de Rivoli, 28.
Hotel Westminster, Rue de la Paix.
Hotel Windsor, Rue de Rivoli, 38.

HOTELS IN THE NEIGHBOURHOOD OF THE BOURSE AND COMMERCIAL HOUSES.

Grand Hotel d'Albion, Rue de Bouloi, 20.
Hotel d'Allemagne et Navarras, Rue de Bouloi, 13.
Hotel des Hautes Alpes, Rue Richelieu, 12.
Hotel des Ambassadeurs, Rue St. Anne, 73.
Hotel d'Athenes, Rue St. Roch, 39.
Hotel d'Angleterre, Rue des Filles St. Thomas, 10.
Grand Hotel d'Angleterre, Rue Montmartre, 56.
Hotel Bescancon, Rue de la Sourdière, 3.
Hotel Bibliothèque, Rue de Bibliothèque, 25.
Hotel Bouloi, Rue Bouloi, 5.
Hotel Bourdeaux, Rue Montmartre, 96.

Hotel Bretagne, Rue Croix des Petits Champs, 14.
Hotel Bretagne, Rue Richelieu, 23 bis.
Hotel Bruges, 34, Rue Valois, Palais Royal.
Hotel Bruxelles, Rue Richelieu, 43.
Hotel du Commerce, Rue Bouloi, 18.
Hotel de Normandie, Rue St. Honoré, 240.
Hotel Rome, Rue Montmartre, 136.
Hotel Rouen, Rue Croix des Petits Champs, 42.
Hotel St. Armand, Rue de Bouloi, 14.
Hotel St. Roch, Rue St. Roch, 13.
Hotel Sourdière, Rue Sourdière, 2.
Hotel de Tours, Place de la Bourse.
Hotel de Tyrol, Rue Montmartre, 162.
Hotel de Toulouse (vis à vis la Banque de France), Rue Baillif, 2.
Hotel de l'Univers et Etats Unis, Rue Croix des Petits Champs, 10.
Hotel de l'Univers, Rue Fontaine Molière, 21.
Hotel Voltaire, Rue Racine, 18.
Hotel de Vosges, Rue du Croissant, 6.
Hotel des Voyageurs, Rue Montmartre, 112.
Hotel de York (ci-devant Hotel Choiseul), Rue St. Anne, 61.

Hotels on the South Side of the River.

Hotel d'Angleterre, Rue Jacob, 22.
Hotel Beauvais, Rue St. Jacques, 185.
Hotel Bellevue, Rue Grenelle St. Germain, 56.
Hotel Berry, Rue de Seine St. Germain, 24.
Hotel Bou la Fontaine, Rue de Grenelle St. Germain, 16.
Hotel Bordeaux, Rue Jacob, 17.
Hotel Borysthène, Rue Vaugirard, 30.
Hotel Boulogne, Rue St. Germain l'Auxerrois.
Hotel Bourbonnes-les-Baurs, Rue de l'Université, 9.
Hotel Bruxelles, Rue de Seine, 44.
Hotel Chemin de Fer de l'Oust, Boulevart Montparnasse, 43.
Hotel Clarence, Rue Grenelle St. Germain, 26.
Hotel Colonies, Rue St. Dominique St. Germain, 35.
Hotel Corneille (near the Garden of the Luxembourg Palace), Rue Corneille, 5.
Hotel Coté d'Or, Rue St. Dominique St. Germain, 3.
Hotel Deux Jumeaux, Rue St. Jacques, 15.
Hotel Empereur, Rue Grenelle St Honoré, 20.
Hotel Etrangers, Rue Racine, 2.
Hotel France, Rue Bonaparte, 50.
Hotel Grenelle, Rue Grenelle St. Honoré, 17.
Hotel Henri IV., Rue St. Jacques, 9.
Hotel Intendance, Rue de l'Université, 50.
Hotel Jacob, Rue Jacob, 44.
Hotel Lisbonne, Rue Vaugirard, 4.
Hotel Londres, Rue Buonaparte, 3.
Hotel Londres et de France, Rue Fosse St. Jacques, 20.
Hotel Louisiane, Rue Jacob, 5.
Hotel Louvre, Rue Fosse St. Germain l'Auxerrois, 38.
Hotel Luxembourg, Rue Vaugirard, 54.
Hotel Luxembourg, Rue St. Jacques, 69.
Hotel Maroc, Rue de Seine St. Germaine, 47.
Hotel Voltaire, Quai Voltaire.

PARIS UNIVERSAL EXHIBITION.

A letter has recently been addressed to the Chambers of Commerce of the United Kingdom by the Board of Trade, calling the attention of those which are established in the various seats of British industry to the machinery for producing manufactures, and to the manufactures themselves, which are exhibited in the Paris Exhibition by France and other European countries; and of those Chambers which are situated in our great seaport towns, to the various kinds of imports, and especially those from the Colonies of the United Kingdom. At the same time, a suggestion is made that it would be advisable if the Chambers were to depute some of their members, possessing technical knowledge on the subject, to visit the Paris Exhibition, for the purpose of furnishing a detailed report of the result of their observations. It is believed that the progress of manufacturing production shown on this occasion, and its probable competitive influence on the markets of the world, will be found to be well worthy of the serious consideration of the producers of the United Kingdom, and should the suggestion be carried out with proper spirit, the Board of Trade expresses an opinion that a series of Reports on the industrial position and recent progress of Europe would be obtained far more practical and useful than any reports which the Board could hope to obtain itself through its own agency.

ON THE SANITARY APPLICATIONS OF CHARCOAL, AND ON VENTILATION.

By J. Forbes Watson, A.M., M.D., Bombay Army.

Before considering a few of the more definite methods by which charcoal can be brought to bear as a sanitary agent, I would touch shortly upon its action, or the manner in which it deals with, and destroys, the various noxious gases which result from the decomposition of animal and vegetable matter.

The power of charcoal as a purifier of water and sweetener of tainted meat has been known, probably for ages, but it is to Dr. Stenhouse, of St. Bartholomew's Hospital, that we are indebted for the elucidation of the principle on which it acts, as well as for the idea of applying it to the filtration of impure atmospheric air; but to Mr. Turnbull, of Glasgow, belongs also the credit of having first demonstrated and directed attention to its wonderful power over decaying animal matter.

Charcoal, as is well known, has the power of absorbing various gases in large quantities, and, perhaps, few more readily than those which arise during the decay of dead animal and vegetable substances. But charcoal does something more than simply absorb, for it is evident that, if it possessed no other property, a point would shortly be reached, when, having become quite saturated, it would cease to act. Charcoal, then, has another power in addition to that of absorption, and for the illustration of this I would refer to the following striking experiment:—Certain dead animals were placed in an open box and covered with a layer of roughly-pounded wood charcoal, rather less than three inches in thickness, and all the decomposible portions disappeared more rapidly than if they had been buried in the ordinary way. Moreover, the boxes containing these dead animals were kept for many months in a room in which several persons were employed during the day, but still no disagreeable effluvia were detectable, and their health remained unaffected.

All decaying animal and vegetable matters give off, during decomposition, fœtid and deleterious gases, which, in the end, tell as fatally upon the human constitution as does the bite of a viper, or the most insidious poison known to the chemist, and the animals referred to in these experiments formed no exception to this rule—a fact which could be readily ascertained by removing a portion of the charcoal so as to get nearer to the putrid mass below. From this, therefore, it follows that not only does the charcoal hasten decomposition, but that those deadly gases that are constantly being given off, become, in their passage through the charcoal, converted into inodorous and comparatively harmless ones.

The explanation of this peculiar result is simple and very beautiful. Charcoal is an extremely porous substance, presenting through its mass an almost incredible amount of surface, and upon this depends its power of absorbing various gases in such large quantities. The oxygen of the air is the great vivifier of nature. The deadly emanations given off by decomposing matters are in what is called a "low state of oxidation," that is, they contain a comparatively small proportion of oxygen. Combine them with, or force them to take up, more of

this purifying element, and the point is gained—that which perhaps an instant before would have proved most hurtful if breathed, becomes now almost entirely resolved into harmless combinations.

Now charcoal contains within its pores a very large proportion of oxygen, amounting to rather more than eight times its bulk. As already shown, it absorbs the various putrid gases with avidity, and in this way they are brought into intimate contact with the condensed oxygen existing in the charcoal, and the result is as has been described.

Such, then, is the action of common charcoal in dealing with the fœtid gases of decomposition. It not only absorbs but destroys them; that done, it gives out the resulting comparatively harmless products; room is made for more oxygen from the air, and more of these bad gases from whatever source, and thus the process ceaselessly goes on. In this manner the charcoal is, so to speak, constantly purifying itself and under ordinary circumstances, with occasional exposure in front of a large fire, or to the sun's rays, its powers remain intact for an almost indefinite period. This secondary, or self-purifying action of charcoal is, however, a slow process, and, therefore, bulk comes to be an important element in calculating the amount of charcoal to be employed in particular cases, as will be shown afterwards.

To increase, then, the oxidizing power of the charcoal, so as to enable in some instances a smaller quantity to be used, is an object of considerable importance, and this for many purposes of the chemist has been effected. Platinum, in a finely divided state, has less power of absorption than charcoal, but it causes oxygen to combine with certain gases with infinitely greater avidity. Dr. Stenhouse, therefore, resolved to endeavour to deposit in the pores of the charcoal, a certain proportion of platinum, in the metallic form, and this he readily accomplished by boiling the charcoal in a solution of this metal in aqua-regia, evaporating to dryness, and afterwards subjecting it to the action of a red heat in a close vessel. The result exceeded his expectation, for he found that charcoal containing only two per cent. of platinum had its alterative or secondary power immensely increased, for some chemical purposes, although, I fear, that practically, the *permanency* of its action over morbid gases will be found to have become diminished by the addition of the platinum.

This conclusion I have reluctantly been obliged to come to from the following experiments:—Small but definite amounts of flesh in an advanced state of decay were covered with equal quantities of common wood charcoal, and of "platinized charcoal," the latter containing platinum in the proportions by weight of six, two, and one-fourth per cent. The jars containing these specimens were carefully and frequently examined. For the first two or three days no smell from either was detectable. After that period, however, a slight odour was perceived from the one with the common charcoal, thus showing that *at first* the addition of the platinum had probably increased the power of the substance. A small additional quantity of common charcoal was then added, and the jar containing this specimen has ever since remained almost constantly on my mantel-piece without causing the slightest inconvenience. The history of the other specimens, or those with the "platinized charcoal," is not so satisfactory. Although at starting, apparently possessed of greater power than the common variety, this in the course of four or five days, ceased to be the case, and it is remarkable that, in the end, the charcoal which contained the 6 per cent. or largest proportion of platinum was found to have the least power, although at first it seemed to have the greatest. From this it is evident that the platinum used in the above experiments had damaged to a certain extent that permanency of power which the charcoal itself usually possesses. It perhaps interfered in some way with the porosity of the charcoal, on which so much depends, but at the same time it is quite possible that its employment in still minuter quantities (or according to a different mode of preparation), may prove of advantage.

These experiments will be again repeated, and with regard to other points in what may be called the "science" of the whole of this most interesting subject, I may mention that a good deal has yet to be done.

The practical facts are, however, such as have been indicated, and these are amply sufficient to prove that in a sanitary point of view charcoal is not only the cheapest and most easily applied, but, perhaps, the most effective agent yet discovered.

Given, then, a substance with properties such as have been detailed, the question next comes to be how most efficiently to apply it?

The idea of the air filter, as already mentioned, originated with Dr. Stenhouse, but believing that something had still to be done with regard to its practical development, and foreseeing, moreover, that unless some striking demonstration was afforded to the public of the powers of this material, much valuable time was certain to be lost, I proposed to Dr. Stenhouse that we should conjointly carry out, on a somewhat extensive scale, a series of investigations into the modes of more practically bringing charcoal to bear as a sanitary agent than had yet been effected.

This was accordingly done, and last month the apartments in which these were carried on were thrown open to the public, so as to enable all who took an interest in the subject to judge for themselves,* and it now remains for me to detail the methods which have been adopted in these experiments, and to indicate the practical deductions which are to be drawn from them.

The first and most important application of charcoal as a sanitary agent to which I would refer, is one by which in a definite manner pure air can be insured to individuals in the mass. This is effected by means of a charcoal filter, through which the air is made to pass preliminarily to its diffusion within the building, &c., to be ventilated. More than six months ago charcoal had been applied for this purpose, both at the Mansion House and at Guildhall, but its power when dealing with a decidedly impure atmosphere had still to be demonstrated.

Ample proof, from many sources, had been afforded of the wonderful power of charcoal over a polluted air under *still* conditions, but the problem for solution continued to remain, whether a putrid atmosphere, passing at the rate of many hundred cubic feet per minute, would become purified; whether, in short, the charcoal would have time, so to speak, to secure and destroy the various impurities during their passage. The amount of charcoal to be employed had likewise to be settled, for it was quite clear that its powers must have a limit, and that only harm would arise to a good cause by assuming too much. For this purpose, the filter used in these experiments was so constructed as to allow the amount of charcoal employed to be varied according to circumstances.

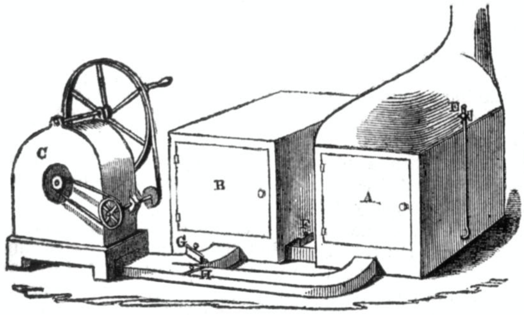
The charcoal air filter then, in the present instance, consists of a case in which are placed a series of layers of common wood charcoal, broken into angular fragments, varying from the size of a pea up to that of a large bean. These are contained in flattened cages, made of stout wire gauze, set in wooden frames, and the air to be purified is forced through by means of a revolving fan of the requisite power.

Of course, in all cases the size and shape of the filter—the thickness and extent of charcoal to be employed—the power of the fan, and so forth, must be adapted to circumstances, as, for example, the volume of air required for the ventilation of a given building—the facilities for moving the apparatus—the known malariousness of a district, &c.

* Further opportunity for this is about to be afforded by the removal of our apparatus to the Polytechnic

The filter used in the experiments referred to, and of which A in Fig. 1 is a representation, is of considerable

Fig. 1.



dimensions, sufficiently so, in fact, to ensure the purification of the air necessary for a building of very large size. Light portable ones, however, of simple construction, with small fans, throwing from two to three hundred cubic feet of air per minute, could be made, and these would be perfectly sufficient for the ventilation of hospital or other large tents, as well as for buildings of an ordinary size. The case for the air filters may be made of wood or other materials. The present one is constructed of zinc; it is three feet six inches in length; the same in height; and two feet in breadth; and the thickness of each of the filters, as seen in section in Fig. 3, amounts to three inches, giving, when the whole four are employed, a depth of 12 inches of charcoal fragments through which the air to be purified has to pass. These filters are made to slide air-tight into their places, and can be readily removed at pleasure.

The fan employed, C, Fig. 1, is calculated to throw, when worked by the hand, about six hundred cubic feet per minute, but from this amount 200 cubic feet will probably have to be subtracted, on account of the resistance offered by the charcoal, but this may be reduced to a fraction by increasing the extent of surface presented by the filters. In some cases, as in warm climates, it is, however, an object to secure a certain amount of pressure inside the filter, as, by this means, the temperature of the air in the apartment to be ventilated becomes lowered, and this affords a reason why, under such circumstances, the fan to be employed should be capable of forcing (or drawing, as the case may be,) the air through with considerable power. The one used in these experiments throws a large volume of air, but not with much force, but, even, with it the average of a number of thermometric observations showed that the temperature of the air in the adjoining apartment had suffered a diminution of 1½ degrees in consequence of its passage through the filter.

The filter constructed as described, it then remained to ascertain, in the first place, the extreme point to which the power of a certain quantity of charcoal could be pushed; to get, in short, some definite idea of the capabilities of the substance with which we were dealing. This was effected by placing in the bottom of the filter, as attempted to be shown in Fig. 3, a jar, or, in reality, two jars, containing several dead rats in an advanced state of putrefaction. a fact which could be readily ascertained by opening the door of the filter, or the stop cock at E in Fig. 1. The tube there shewn communicated with the bottom of the filter, in which these matters were, and the purity of the air after its passage through the charcoal could be readily demonstrated by means of the opening at A in Fig. 4, (this figure will be inserted in the next number,) as well as by a small aperture immediately at the top of the filter. In the experiment above referred to, the layers of charcoal amounted to nine inches in thickness, and the jars containing these dead animals were kept *constantly* inside the filter-case, and the air after its passage frequently and carefully tested. For nearly four days it stood this extreme trial, but at the end of that period it commenced to fail; the fœtid gases which had hitherto been secured and destroyed during their passage through the charcoal could now be detected.

Fig. 2.

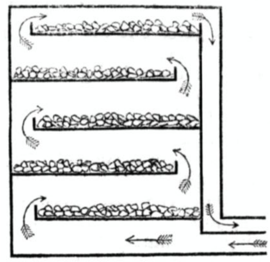
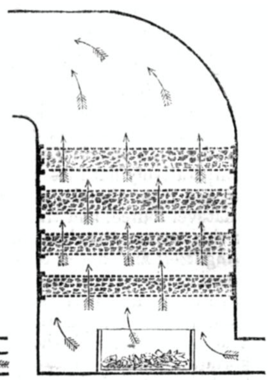


Fig. 3.



A limit to the power of the filter had in short been reached, and it now, therefore, remained, either to increase the bulk of the charcoal through which the air had to pass; to introduce a fresh supply; or to allow that already in the apparatus time to recover itself. The first and last of these alternatives were adopted. An extra layer of charcoal, three inches in thickness, was inserted, and those already in the filter freely exposed to the air, and the precaution was also taken of employing only one of the jars and removing it at night, and the whole then continued in satisfactory operation until the completion of our experiments, or for a period of about three weeks.

On several occasions a little fœtor in the filtered air could be detected, and at the expiration of a fortnight fresh charcoal was introduced, but the fault had not lain with it, as the annoyance entirely ceased on repadding the sides of the filters, so as to ensure more completely the passage of all the air through the charcoal; and I mention these particulars in order to suggest to others the precautions which are so essential in experiments of this nature.

With regard to the practical results to be deduced from these observations: the first I believe is, that in no case should the air-filter, or body of charcoal employed, be less than six inches in thickness, and although it would be hardly possible to conceive conditions which will more severely test its powers than those made use of in the foregoing experiments, still, in all cases, the error in point of bulk ought to be on the "safe side," for it at most only involves the use of a few inches more of charcoal, and, perhaps, a fan of rather more power; and having once laid down the amount of charcoal to be employed, it may be arranged in a single compartment so as to form one layer, as by this means the size of the case (when one is required) can be very much diminished. I should likewise recommend that a spare filter of the proper dimensions be kept in reserve, so as to enable the one in use to be replaced once a week, or oftener if necessary; and that not employed ought to be, in the interim, freely exposed to the action of the air and sun's rays, or to heat in front of a fire, and it would, perhaps, also be advisable to refill the filters with fresh charcoal every six months or so.

So much, then, for the "charcoal air-filter," an application the importance of which, I believe, can hardly be overrated.

In addition to the air-filter is, however, another contrivance, which I consider likely to prove of much advantage, especially in tropical countries.

During the course of a series of observations made in India, on the direct influence of climate on the human body, I found that after a period of continued rain—

as during the monsoon—the blood became deteriorated in a remarkable and striking manner; and that this was no accidental occurrence was proved from the fact that it was found, towards the end of the rainy season, to exist, without exception, in every case which I examined. The details of these observations will be published elsewhere, but I may shortly mention that the chief alteration alluded to was found to occur in the blood corpuscles, as ascertained by achromatic microscopes, under every possible precaution for securing truthful results. The change presented itself in two ways: in the first the red globules of the blood, which are usually pretty regular in size, were found to vary, and that to a considerable extent, some of them being not larger than the one-six thousandth of an inch in diameter, or nearly one-half less than ordinary; but the most striking feature was, that the great majority of them, instead of presenting their usual smooth appearance, were found studded with small highly-refracting granules, evidently from that, and other circumstances of a fatty nature. The blood-cells, in short, had undergone a change which some of my readers will recognise as constituting that peculiar morbid condition known, when affecting various tissues, under the name of "fatty degeneration."

The reason for this change under the circumstances referred to it is not difficult to divine. An excessive amount of moisture in the air interferes materially with the functions of those two great filters, the lungs and the skin, and the result is that the vital conditions of the blood itself become altered, and ultimately the general health impaired; and, although the inhabitants of temperate climates are not liable to be exposed for any very lengthened period to such influences, still, doubtless, to a certain extent, the same effects are produced in all countries during protracted wet weather.

Grant this, and it becomes, therefore, an object of importance to remove from the air a certain proportion of its moisture when excessive in quantity.

This can, to a considerable extent, be effected by passing the air, previously to entering the charcoal filter, over a series of trays containing quicklime. In Fig. 1, B represents a lime-box, of which Fig. 2 shows a section, which will sufficiently explain the arrangement adopted.

The case containing the limetrays is made of stout tin, and of the same dimensions as its neighbour, the air-filter, and at G H and F in Fig. 1 are stop-cocks of simple construction, which admit of the drying apparatus being used at pleasure. The trays containing the quicklime are five in number, three inches in depth, three feet three inches in length, and two feet in breadth, thus presenting a drying surface of upwards of 32 square feet in all.

The lime employed ought, of course, to be as fresh, or "quick," as possible; it should be in pieces about half the size of a man's hand, and the trays ought to be only three-fourths filled, in order to allow for the increase of bulk which attends the process of "slacking," during the passage of damp air, and which, from the nature of the arrangement, occurs with tolerable facility, especially if the fan be slowly driven, so as to allow the air to pass more gradually.

For this country an apparatus of the size here indicated would likely be quite sufficient, but, considering the very large amount of moisture which an Indian atmosphere contains during the monsoon, I am inclined to think that perhaps one of larger dimensions, with a couple of additional trays or so, may be required. This is, however, a matter of experience which cannot be settled at this distance.

In order to have, as far as possible, Indian conditions, I saturated, by means of steam, the air in the outside apartment, in which the fan, &c., were placed, and then carefully tested the effect produced by the lime-box, or desiccator, and these observations, as well as those formerly alluded to, were repeated by Mr. Richard Tuson, with results similar to my own.

In the outer room, the air, on testing it with Daniell's hygrometer, was found to be within rather less than one degree of saturation, whereas, after its passage through the apparatus, the dew point was found to have fallen between six and seven degrees, indicating that a considerable drying effect had been secured, although the entrance of the external air tended somewhat to complicate the results obtained.

I may mention that, the slight increase of temperature, caused by the lime-box, appeared to be fully compensated for during the passage of the air through the charcoal filter, and probably this could in all cases be more than counterbalanced by enveloping the apparatus in wet cloths, &c., and this leads me to make a few remarks on the cooling of the air in tropical countries,—a subject of very great moment, but one, towards the practical accomplishment of which, a great deal has yet to be done.

The low conducting power of the air offers a barrier to any great cooling effect being produced by the direct action of the cold generated during the vaporisation of water, but still some good can be effected by having the cases, tubes, &c., covered with wet cloths, and kept in a draught. The question, however, of sufficiently reducing the temperature of the air, in a tropical country, resolves itself into, how cheaply and efficiently to condense atmospheric air, so as to allow it to give off its latent heat previous to its admission and circulation within a given chamber? This, to a certain extent, has already been done, but the expenses, involved in carrying out the process, have hitherto rendered it practically unavailable.

The method adopted in India of cooling the air by means of "*tatties*," or wet mats, through which the air is made to pass, I consider, in the great majority of cases, to be decidedly objectionable, on account of the effects, on the system, which are induced by the moisture thus introduced into an apartment. It is, doubtless, agreeable to the feelings in the mean time, but the results eventually produced are, I believe, detrimental to health. The hot dry season in India is the most trying, as far as the sensations are concerned, but it has to be noted that, upon the whole, it is more healthy than any other period of the year; and from my own observations at Jacobabad, in the desert of Upper Sinde, I am inclined to think that the existence of, even, a certain proportion of moisture, in the air, is not so necessary as is generally believed, and at the worst, in the vast majority of cases, only involves the drinking of a pint, or more, of extra fluid.

During a series of experiments made towards the end of the cold season, in February and March of 1852, embracing a period of twenty-five days, I found that the average quantity of moisture, by weight, existing in the atmosphere, as ascertained by passing a definite volume through a tube containing chloride of calcium, the same as used in organic analysis, did not, over the whole of that period, amount to—*one grain* in the cubic foot of air; and on several occasions the atmosphere was perfectly moistureless! as was shown by the fact, that the apparatus, at the termination of the experiment, had not only not gained, but had actually lost, weight from the desiccation of the chloride of calcium itself produced by the dry air passing over it. During the whole of the cold season in Upper Sinde the air is extremely dry, but, nevertheless, a more agreeable climate than it *then* possesses does not perhaps exist anywhere.

(*To be continued.*)

ON THE "DESCRIPTIVE MEASUREMENT" OF SHIPS AND STEAMERS, DEFINING THEIR TONNAGE, DISPLACEMENT, AND CAPACITY; AND A REVIEW OF THE BILLS RECENTLY BROUGHT BEFORE PARLIAMENT WITH REFERENCE TO THEIR SAFETY AND CAPABILITIES FOR MERCANTILE TRANSPORT SERVICE.

By Andrew Henderson, M.S.A. & Assoc. Inst. C.E.

On entering upon a subject which will lead to very extended remark from me, I shall first draw your attention to the actual position which the question occupies, together with the opinions which have been recently given on the subject by different scientific men, and I shall then offer some observations resulting from my own acquaintance with the subject.

On the 16th of May last, a paper was read at the Society of Arts by Mr. Atherton, Chief Engineer, Woolwich, on "The Capability for Mercantile Transport Service of Steam Ships, with reference to the Mutual Relations of their Tonnage, Displacement, Engine Power, Steaming Speed, Distance to be Run without Re-Coaling, Tons Weight of Cargo, and the Expense Incurred per Ton of Cargo Conveyed." This interesting paper was prefaced by a speech from the noble Chairman, the Right Hon. the Earl of Hardwicke, in which, among many observations remarkable for their point, there was none more applicable to the subject of this paper than the following:—"The subject to be submitted by Mr. Atherton appeared to him to be one more wanting to be considered than almost any other, a subject, it appeared to him, at this moment, if considered and brought into a proper focus, and into a properly tabulated and graduated form, which would render more service in point of revenue to the State, in point of revenue to the merchant, in point of fitting to the ship, than any other point which had been considered in reference to steam power. If from the meeting of to-night should emanate a system which might be secured and fastened upon the maritime power of this country, then indeed should he glory in having been their chairman."

To effect the objects alluded to in this speech, a Bill was brought into the House of Lords by the Earl of Hardwicke, entitled, "An Act to make further Regulations as to the Measurement and Registration of Merchant Steamers." In moving the second reading of this Bill, the noble Earl said that, "he was desirous that some addition should be made to the existing law as it affected measurement and registration." * * * "The internal measurement of a ship, by which the tonnage was calculated, was merely a statement of its capacity for holding a certain quantity of materials, but then the question arose, what these materials might be?" * * * "It was necessary that persons who wished to purchase the use of a ship or to obtain her services, should possess the means of ascertaining accurately what weight of materials she would carry." The noble earl then clearly showed that it was possible for the tonnage of a vessel to represent by measure an amount which her real power of carrying did not approach, while on the other hand, the tonnage of a ship by measurement might in reality be very much beneath her real carrying power. The third clause of this Bill proposed that the certificate of the builder and surveyor previous to registry, should specify the deep, light, and launching draught of water, and the corresponding external measurement expressed in cubic feet, the displacement in tons weight to be deduced therefrom.*

In opposition to this, the President of the Board of Trade urged, with reference to new measurement under the Merchant Shipping Bill of 1854, "that the objects of the Bill were to procure a test of the size of the ship for light, dock, and other dues." * * * "That of the two modes, first by displacement, to ascertain the weight carried, and, secondly, by measurement, to ascertain the available space, it was more important to ascertain the number of cubic feet in a vessel, and to accomplish that object the alterations were made, so as to give an accurate measurement of the capacity of a ship in cubic feet." "That this subject had been brought before government by a commission which heard evidence and recommended Moorsom's plan for adoption, adding that it had been submitted to all the local marine boards, Trinity boards, and to the Admiralty, the only dissentients to Moorsom's plan being one assistant-surveyor and one master-builder of H.M. dockyard." The noble president concluded by saying, that as not one single objection had been made to the present mode, a sufficient case had not been made out, and he opposed the second reading of the Bill. Lord Colchester, however, seconded the Earl of Hardwicke's proposal, that the subject might be referred to a select committee, but this was negatived by 28 to 21, in consequence of the opposition of the government.

It should be observed, that the technical difficulties and consequent misunderstanding to which the noble president of the Board of Trade alluded in the opening of his speech, are fully borne out by the inaccuracy into which he appears to have fallen, for he assumed that the government commission had recommended for adoption Mr. Moorsom's system of internal measurement, and that it was more important to ascertain the available space of a vessel than it was to know her displacement or the weight she could carry. The real facts are these. The committee of 1849, of which Lord John Hay was chairman, reported, "that the equitable basis on which charges, for dock, harbour, and other dues should be made, is the entire cubic contents of all vessels measured *externally*." In 1850, a Bill was brought in by Mr. Labouchere, the then President of the Board of Trade, carrying out this system of external measurement (as proposed by Mr. Parsons, a member of the committee,) by the use of diagrams and curves of areas, the eleventh clause providing a scale of displacement for ascertaining the weight of cargo received or discharged, such as was proposed in the Bill brought in by the Earl of Hardwicke. This last clause of the Bill of 1850 enacted that, "The owners of ships measured by Rule No. 1 may require from the Commissioners of Customs, upon payment of the expense of making such scale, a table of tonnage for ascertaining the weight of cargo to be received on board or discharged, to be attached to the certificate of registry." With reference to this, I proposed to the Board of Trade, in March, 1850, an amended Bill and plan, suggesting that as the Bill did not clearly define the mode in which the areas were to be measured, the curves formed, &c., that by substituting for the above part of the 11th clause, detailed rules or directions for the measurement of transverse areas, the formation of diagrams, of sections, and curves of areas, as well as the computation of tonnage and displacement, and enacting that these be recorded on the certificate of survey, signed by the builder, owner, surveyor, and registrar, all difficulties would be obviated and the scale of tonnage provided. Notwithstanding these suggestions, Mr. Labouchere's bill for *external* measurement was opposed by Mr. Moorsom, who advocated the continuance of the internal measurement then existing, merely substituting a more correct calculation. This plan of Mr. Moorsom's, adopted in the Bill of 1854, so far from having been recommended by the Tonnage Committee, is in principle and detail in direct opposition to it.

Both the Report of the Tonnage Committee, and the Bill of 1850, based the tonnage on the entire cubical contents of the ship, measured externally to the height of the upper deck, by the use of diagrams of sections and curves of areas, using the factor 27-hundredths of

* The fourth clause proposed the standard measure or unit of marine horse-power to be 100,000lbs. raised one foot high in a minute, *as being nearly in accordance with the actual amount of working power now usually called horse-power in marine engines.*

the bulk or displacement for a registered tonnage, approximating the old or builders' tonnage.

Objections were raised to external measurement by Mr. Gilmore, the owners of timber ships, and builders of iron ships, on the assumption that light or measurement cargo exceeded in tonnage the heavy or dead weight goods; and on the ground that iron vessels had much greater internal space than timber ships. A reference to Trade Returns, No. 51, of 1850, has shown that of the total exports and imports, amounting to 10,760,217 tons, there were 7,482,214 tons of heavy goods—only 31 per cent. being light or measurement cargo, the heavy or dead weight goods amounting to 69 per cent. of the trade. As the capacity of iron ships for light goods exceeds that of timber ships from ten to fifteen per cent., it is evident that a system combining both external and internal measurement would be most equitable.

In May, 1850, I submitted to the Board of Trade a plan and formula, showing that the mode of external measurement and computation of bulk and tonnage adopted in Rule No. 1 of the Bill of 1850, was equally applicable to ascertaining the internal capacity; and that by one measurement, taken either externally, as proposed by the Bill, or internally, as proposed by Mr. Moorsom, both the external bulk and internal space could be ascertained by means of diagrams and curves of areas; and to meet the irregularities of light goods and dead weight of iron and timber ships, *I then proposed and still advocate* the adoption of the mean of the external bulk and internal space in cubic feet as the bases of register tonnage.

The question remained in abeyance during the sessions 1851, 1852. Mr. Moorsom, however, published his plans from time to time, with the opinions of several naval architects, surveyors, and others, which were submitted to the local Marine Boards; that of London reporting that "*in the absence of any other proposed plan they recommended its adoption.*"

In November, 1852, I again forwarded copies of my plan to the Board of Trade, with the request that they might be similarly placed under the consideration of the several local Marine Boards, Government officers, and shipowners, suggesting, also, the organisation of a tonnage committee, consisting of members of those boards and of scientific institutions, &c. My plans were not submitted to the local Marine Boards, nor was any attention paid to the suggestion of extending the nautical department of the Board of Trade by a Board of Mercantile Marine, where each branch of the shipping trade wou d be represented by men of nautical and practical experience. The subject of tonnage measurement was subsequently brought before the Institution of Civil Engineers, when Mr. Moorsom was invited to take part in the discussion, but declined. On this occasion so much interest was absorbed by the large steamer now constructing in the Thames, that no conclusion was come to on the measurement question, after the lapse of a month, beyond the mere record on the archives of the Institution of an attempt to ascertain and define the capabilities and tonnage of ships and steamers in a tabulur form, as since proposed by Lord Hardwicke.

A reference to an abstract of the table annexed will greatly facilitate the explanation necessary to define the relative advantages of the different modes of measurement. Therein will be found the names of some thirty ships and steamers, their tonnage, displacement, draught, burthen, and resistance, as well as the average speed realised over many thousand miles, &c. The 7th column contains their tonnage by the old law, or builders' measurement, by which the shipping statistics were recorded up to 1835, in which year, after considering twelve plans, an Act was passed adopting an internal measurement, which was amended in 1845, from which time to May in the present year, the tonnage of ships was based on the internal measurement of the length, six breadths and three depths, the divisor 3,500 giving the register tonnage of sailing ships, the contents of the engine-room of steamers being deducted from the gross tonnage, as stated in the ninth column of the table, showing in the eighth column the register tonnage of steamers about two-fifths less than the gross tonnage, on which sailing ships are registered, and pay light, dock, harbour, and other dues.

The tenth column represents the external bulk in cubic feet recommended by the Tonnage Committee and Bill of 1850 as the basis of register tonnage, computed at 27 hundredths. The 11th column represents the internal space in cubic feet proposed by Mr. Moorsom as the basis of register tonnage, using the divisor 100, and adopted in the Shipping Act of 1854, on the grounds of expediency, that, by an easy process, "ships' capacities and liabilities to taxation might be approximated, while retaining the number denoting the tonnage of the empire."

The three lower lines of the table contain both the external bulk and the internal space of the ships *Monarch*, *Essex* and *Euphrates*, as taken from experimental measurements made externally by Mr. Moorsom for the Committee of 1849; the internal space being calculated from those measurements (less the thickness of side). These were published in his paper on Tonnage to show the practicability of computing the displacement from internal measurements, and thus prove the correctness of my statement—that by one measurement, either internally or externally, both the bulk and space can be correctly computed in cubic feet.

My proposal is to adopt the mean of these two quantities as the most equitable basis for register tonnage, which is exemplified in the 12th column, for seven vessels of different size and construction, The 13th column contains the proposed register tonnage deduced by the factor 30-100ths of the tonnage displacement of the mean bulk and space, producing a register tonnage a little below the old tonnage, or register of merchant shipping, denoting the tonnage of the empire, that is the old tonnage in the 7th column. To effect this it may be necessary to vary the factor for different classes of vessels. A comparison shows the factor 30-100ths produces the required tonnage for the large ships *Monarch* and *Essex*, but it exceeds the old tonnage 2½ per cent. in the *Euphrates*, a deep burthensome vessel, while with the *Kelpie*, a very shallow sharp clipper, the tonnage was reduced from 355 tons, old tonnage, to 254 tons proposed register, which was about the cargo the vessel did carry, either of dead weight or light goods.

These were all timber-built ships, but to test the applicability of this mode to iron and other ships, three lines give the external bulk of a screw steamer of 350 tons, old measurement, with separate calculations of the internal space of the same vessel built of timber, of timber and iron combined, and of iron, the latter having nearly 16 per cent. more space than the timber ships of the same bulk; by adopting the mean as the basis, a factor 30-100ths would give the timber-built ship a register tonnage of 247 tons, and an iron ship 263 tons, reducing the difference to 6½ per cent., equivalent to the additional capacity for light goods of the iron ship, as well as for burden or dead weight, arising from their hulls being lighter than timber ships—proving that iron ships ought to be registered more than timber ships. This will be exemplified by comparing the following bulk, space, cubic contents, and weight of hull of an iron ship with those of a timber ship, calculated from detailed plans and specifications of materials. Those of a timber ship built according to Lloyd's rules, weighing 185 tons, rigged and fitted for sea, to same vessel built of iron, weighing 148 tons.

The cubic contents of an iron-built ship as follows:—

External bulk . .	34,612	cubic feet.	
Internal space . .	26,776	do.	ratio to bulk 773
Cubic contents of hull	7,836	do.	ratio to space 291

The hull of the iron ship occupying only three-tenths of the internal space; that of the timber-built ship one-half.

TABULAR COMPARATIVE ANALYSIS OF SHIPS AND STEAMERS, THE OLD, LATE, NEW, AND PROPOSED MEASUREMENT FOR TONNAGE, THEIR DRAUGHT, DISPLACEMENT, WEIGHT, BURTHEN, RESISTANCE, AND SPEED REALISED.

VESSELS' NAME, BUILDER, AND DATE.	DIMENSIONS. Length.	Breadth.	Depth.	Ratio of Length to Breadth.	Ratio of Depth to Breadth.	Old or Builders' Tonnage, based on the Breadth & Length of Keel only, the Depth being assumed to be half the Breadth.	Register of Steamers and Ships by Internal Measurement, from 1845 to May 1855. Tonnage. Register Exclusive of Engine Room.	Gross Tonnage.	MEASUREMENT OF TONNAGE PROPOSED. By Tonnage Committee Bill, 1850. External Bulk to Medium Height of Upper Deck.	By Measurement Act, 1854. Internal Space, exclusive of beam, decks, &c.	By A. Henderson, adopting both internal & external measurement. Mean of External Bulk and internal space.	Factor ·30, ·31, or ·32 hundredths of Mean, in cubic feet, Divisor 35, for Register Tonnage.	Load Draught Forward.	Displacement.	Weight of Hull.	Weight of Engine, Boilers, & Water.	Area of Cross or Middle Section.	Average Speed at Sea.
	Feet. Inches.	Feet. Inches.	Feet. Inches			Tons.			Cubic feet, Factor 27.	Cubic feet. divisor 100.								
Noah's Ark .... B.C. 2,348 years.	450 0	75 0	45 0	6.0	0·6	11,905												
Ptolemaus Philopater .... B.C. 190 years.	420 0	56 0	...	7·6	...	6,445												
							Tons.	Tons.			Cubic feet.	X F. Tons.	Ft. In.	Tons.	Tons.	Tons.	Feet	Knots
Baron of Renfrew .... C. Wood 1825	304 0	61 0	34 0	5·10	...	5,294							...	...			...	...
Great Western .... Pattison 1838	207 3 W	35 2	...	5·86	...	1,242	1,154	1,755	..	...	...	... ...	17 0	2,393	926	400	480	8·82
Acadia, Halifax Line .... Wood 1839	207 6¼	34 2 E	22 2 H	6·07	·64	1,156	...	...	...	...	...	... ...	17 0	2,186	766	420	482	8·50
Thames, West Indies .... Pitcher 1841	215 0	36 0	30 W	5·98	·85	1,330	1,240	1,889	...	...	...	... ...	17 0	2,363	923	400	475	...
Comprehensive, designed by ... A. Henderson, 1839	240 0	42 0	34 0	5·71	·80	2,015	...	...	259,961	226,660	243,620	30=2,085	19 6	3,335	1,300		608	...
P.&O. Co. { Precursor } Calcutta Line { Napier 1842	225 W	37 W	24 H	6·08	·65	1,476	1,133	1,817	164,702	...	...	... ...	17 0	2,505	925	520	...	7·733
P.&O. Co. { Haddington } Calcutta Line { Bailey 1844	219 6 W	35 W	31 6 W	6·27	·90	13,03	1,107	1,648	...	...	...	... ...	17 0	2,300	1,200	360	525	8·154
P.&O. Co. { Bentinck } Calcutta Line { Wilson 1843	217 0	36 0	...	6·03	...	...	941	1,974	...	...	...	... ...	...	...	...	...	...	7·988
Ajdaha .... Indian Navy ... Ritherdon 1846	P 220 Ex.	37 E	23 0	5·94	·62	$1,440\frac{34}{94}$	...	...	...	...	...	... ...	...	...	...	...	...	8·568
Acbar .... ditto ... Ritherdon 1841	P 206 5 Ex.	34 E	21 6	6·71	·63	$1,143\frac{74}{94}$	...	..	...	...	..	... ...	...	...	...	...	...	8·538
Locust, H.M.'s str. Malta line ... Symonds 1840	117 6 W	22 8 W	13 8 W	5·14	·65	282	...	...	...	...	...	... ...	9 10	416	186	100	182	...
Merlin do. do Symonds 1831	171 8 W	33 W	17 8 W	5·20	·53	889	...	...	...	...	...	... ...	11 7	1,073	393	329	296	...
India, East Indies .... Scott 1840	P 189 0	28 10	26 W	6·55	·89	767	501	1,206	...	...	...	... ...	15 0	1,260	560	300	380	7·72
Lady Mary Wood 1842	160 6	25 5	...	6·30	...	...	297	554	...	...	...	... ...	...	...	...		...	7·78
Achilles .... China Line... 1840	205 0	27 0	...	7·59	...	...	587	922	...	...	...	... ...	...	...	...	...	...	8·242
Pekin (Iron) ...... do 1846	214 7	29 7	...	7·25	...	...	759	1,182	...	...	...	... ...	...	...	...	...	...	7·733
Malta .... do 1846	205 9	33 5	...	6·14	..	...	777	1,218	...	...	...	... ...	...	...	...	...	...	7·402
Hindostan .... Calcutta Line 1842	217 6	35 8	...	6·07	...	...	971	2,017	...	...	...	... ...	...	...	...	...	...	9·195
Oriental .... do Wilson altered 1848	220 0	33 5	...	6 58	...	...	1,103	1,785	...	...	...	... ...	...	...	...	...	...	8·468
Hibernia, Holyhead Mail ...... Vernon 1848	190 P	26 9 E	13 9	7·10	·51	662	369	579	...	...	...	... ...	11 2	950	380	320	256	...
Oronoco, West Indies .... Pilcher 1851	267 4 W	41 10 W	33 8	6 38	·70	2,245	1,892	2,901	...	...	...	... ...	19 8	3,798	1,490	700	682	...
Arabia	285 0	40 9	27 7	7·00	·68	2,402	1,359	2,393	...	...	...	... ...						
Arctic American Mail Steamer	282 0	45 0	32 0	6·27	·72	2,856	...	...	...	...	..	... ...	20 0	...	1,525			
Susquehanna ditto	257 0	45 0	26 6	5·71	·59	2,477	...	...	...	...	...	... ...	...	...	2,170	726		
Great Britain, Screw Steamer .... Patterson... 1844	289 0	50 0	32 0	5·78	...	3,444	1,460	2,936	457,332	E.	...	... ...	17 0	3,280	...	...	690	
Himalaya ditto 1853	341 0	46 0	32 6	7·41		3,528	2,327	3,508	457,333	E.	...	... ...						
Bengal ditto ... Tod & Macgregor 1853	309 6	39 6	30 0	7·3	·79	2,180	1,176	2,185	235,116	...	...	... ...						
Argo, Gen. Screw Steam Co., Mare & Co. 1853	245 0	39 6	...	6·20		1,840	1,236	1,815	...	...	...	... ...						
Victoria, Australian, do. ... J. Scott Russell ... 1853	261 4	38 1	27 0	6·85	·71	1,834	...	...	...	177,253	...	... 1852	16 5	3,000			595	11·
Proposed by R. Roberts, Manchester .... Iron	400 0	60 0	35 0	6·66	·58	6,970	...	...	714,818	...	...	... ...	...	...			816	
Do. I.K. Brunel, East S.N.Co. building by J.S. Russell	680 0	83 0	54 0	8·19	·65	22,942			2,973,593	E.								
Great Republic American Sailing Clipper ... Timber	325 0	53 0	39 0	6·13	·73	4,535												
Tayleur, English ditto .... Iron	225 0	39 0	28 0	5·77	·72	$1,631\frac{2}{94}$	...	1,979	193,102	...	...	... ...	18 6	26·80			708	
Screw Steam Packet, constructed of wood .... }						350	...	...	34,612	23,010	28,881	·30 = $246\frac{33}{35}$	...	...	184 }			
Screw Steam Packet, constructed of iron & wood }	P 133 0	24 0	15 2	5·54	·63	...	...	...	34,612	25,616	30,114	do. = $258\frac{4}{35}$	...	...	158 }	...	208	
Screw Steam Packet, constructed of iron .... }						...	...	..	34,612	26,776	30,694	,, $263\frac{7}{35}$	...	...	148 }			
Kelpie, opium clipper, constructed of wood	P 108 0	27 4	17 5	3·94	·64	355	...	...	34,684	24,558	29,621	,, $253\frac{31}{35}$	...	...				
Monarch	...	...	...	...		1,356	...	...	171,586	141,347	156,467	,, $1,341\frac{5}{35}$						
Essex	...	...	...	...		692	...	...	82,056	66,788	74,397	,, $637\frac{24}{35}$						
Euphrates	...	...	...	...		577	...	...	75,657	62,159	68,917	,, $593\frac{26}{35}$						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

The following particulars to be recorded on register, and the seven forms of transfer, mortgage, &c., in the Act:—

Length of weather deck at its medium height 138.9 feet.
Depth from deck to rabbit in keel .... 17.2 feet.
External bulk to medium height of deck ...34.612 cubic feet.
Internal space to under side of deck .... 23.010, ratio to bulk, .665
Cubical contents of hull including lower deck 11.602, ratio to space, .504
Mean of ex. bulk and in. space, cubic feet 28811 ÷ 35 = 825 tons bulk.
Do. do. X Factor by 30=]Register Tonnage, 246 Tons 94-100ths.

Length between perpendiculars at rab bits at stem & stern post, 2-3rds height, 123 feet; Breadth at ditto, 24 feet — ratio of: Length to breadth 5.5; Depth to breadth .67

Displacement immersed to upper deck	988 tons,	18.3 feet high.		
Ditto to load water line or 2-3rds height	538	,,	12.2	Deep displacement.
Ditto light ,, 1-3rd height,	159	,,	6.1	Light displacement.
Area of midship section, height of deck ...	345 square feet.			
Ditto ditto 2-3rds ,, ...	228	,,		
Ditto ditto 1-3rd ,, ...	69	,,		

These particulars furnish the exact size, proportion, capacity, and resistance, and can be obtained through the builder or surveyors now employed in measuring for tonnage, and who by using the ruled paper mentioned above can form a scale of tonnage displacement and resistance, at any draft of water, and show the weight of cargo carried, by a curve run through the three displacements and areas set off on a horizontal scale from the height and draught of water stated on the perpendicular scale.

The strength of the vessels may be ascertained in a like manner, by recording on the certificate of survey a specification in detail of the materials. The exact space occupied by the hull can be found by setting off the thickness of timber, and plank, or iron frame, at measured sections, on a scale, which not only shows the disposition of material and the strength, but enables the surveyor or owner to measure or compute both the dead weight carried at any draught loaded by the scale of displacement, and the capacity for light goods or passengers at any part of the hold or decks by curves of internal capacity on the certificate of survey. This certificate would in effect be a plan and specification of the vessel and materials requisite for safety and strength, their amount and cost being ascertainable from the three quantities of bulk, space, and cubic contents of hull, recorded in cubic feet, their ratio to each other affording a fair criterion of the relative value of different vessels. It is proposed that the certificate of survey should be signed by the government surveyor, builder, owner or captain, and the registrar at the port, made out in triplicate, and a copy retained by the last three only.

In December, 1853, understanding the consolidation of the Shipping Bills was to be brought before Parliament that session, I forwarded to the Board of Trade a printed abstract of the discussion at the Institution of Civil Engineers, and copies of my plan and certificate of survey, describing my mode of measurement as above, with a request that they might be submitted to the Local Marine Boards and shipowners. In reply I was informed that before any measure was introduced into Parliament for alteration of tonnage, the nature and merits of my plan should be considered.

In April, 1854, I learned from the public papers that the Shipping Bill included an alteration in the measurement of tonnage, and when it was printed I found that in principle and detail it was an entire adoption of Mr. Moorsom's plan, as described in his book, which had been officially circulated to the local Marine Boards, and others. The law and rule were comprised in ten clauses (20 to 29); the instructions for measurement being in a separate book, with directions for computation of tonnage.

The Shipping Bills having been before Parliament some months, all questions affecting the interests of merchants, shipowners, or insurers had received consideration. The measurement for tonnage being of comparatively small importance to these parties, it was passed over till the end of the session, lengthened discussion rendering very doubtful the passing of so comprehensive a Bill. This measure was a consolidation of thirty-seven acts relating to the merchant shipping, embracing, in fact, the entire code of laws which at present regulate the mercantile marine of this country. The act consists of 548 clauses, divided into eleven parts, which may thus be classed:—

1st. British Shipping—the nautical and practical questions involved in their construction, safety and efficiency; 55 clauses.

2nd. Mercantile Marine—masters, mates, and seamen; their competency, interests and discipline; 210 clauses.

3rd. Shipowners—their rights, responsibilities, and laws relating to registry, transfer, and mortgage; 112 clauses.

4th. Government Supervision—Trinity house pilots, lights, tonnage dues, and mercantile marine fund.

This consolidated Bill was brought in by Mr. Cardwell, and is a great improvement on the former acts, being a simplified exposition of the law, removing many uncertainties as to the rights and duties of shipowners and seamen, and facilitating the transfer of property and the despatch of business in the custom-house. It is such as might be expected from the legal experience of those to whom the revision of the acts was entrusted, but to a practical seaman there appears a great want of detail in all matters respecting the measurement, build, and efficiency of vessels, as well as in the regulations as to the competency of the officers and seamen, points which I consider can only be effectually determined by those possessed of practical knowledge and nautical experience on the construction and management of ships and seamen. Holding these views, I contented myself with submitting (in a printed form) to the Board of Trade my opinions and objections to the new measurement. I also put in a reprint of the 20th, 21st, 22nd, and 23rd clauses of the present Act, with amendments. I proposed to clause 21 that Rule 1 for internal measurement should have the addition of rule No. 1 for external measurement, and the use of diagrams and curves of areas taken from the Bill of 1850, the rule No. 2 of that Bill being already adopted as rule No. 2 of the present Act for measurement by girthing when ships have cargo on board. The clause enacting that paddle and screw steamers be allowed a deduction of 37 and 32 per cent. of their gross tonnage as a sailing ship I object to as unjust, on the grounds that light, dock, and harbour dues paid on register tonnage are more important to, and occupied by steamers than sailing vessels.

Confident that a few months' experience would lead to these alteration of the Act, the amendments I proposed in the clauses are given in the appendix. The Act was passed 18th August 1854, and came into operation 1st May, 1855. As will be seen, my plan differs distinctly from Mr. Moorsom's, and the statement, therefore, of Lord Stanley of Alderley, in the before-mentioned speech, "that not one single objection had been made to the present mode," and, "that the Government were at all times most ready to receive any objections to the existing system, or communications as to the introduction of a better," must have resulted from incorrect information. I may further allude to to the way in which I have endeavoured to press my views on the attention of scientific men, both at the Institution of Civil Engineers in 1853, and before the British Association, in 1854. Those are societies, it is true, which are not recognised by the Government as influencing their decision of these subjects, but, as was very properly observed by Lord Hardwicke at the Society of Arts, "They did not receive that attention and consideration from certain portions of the public that they required; *when anything in the shape of novelty was introduced it was received with coldness and dissatisfaction, and no man had the slightest chance before the Government authorities of the country of having any great experiment, for any great subject he might have in hand brought to a fair trial.*"

I have now pointed out the manner in which the Board of Trade has dealt with the tonnage question, and the alterations which were proposed by me at the time. It is not surprising that it has been found necessary to make some alterations in so comprehensive a measure.

Shortly after the rejection of this Bill of the Earl of Hardwicke's, a Bill was brought into the House of Commons by the Board of Trade, entitled "Merchant Shipping Amendment Act Bill." The Bill contains 24 clauses, altering six parts of the new Act, the 14th clause enacting, "That the owner of any ship that is measured under Rule 2, in the 22nd section, Act of 1854, may have the said ship re-measured under Rule 1, in the 21st section;" and "upon payment of such fee, not exceeding 7s. 6d. for each transverse section, the registered tonnage shall be altered."

This clause was not in the original Bill, but introduced after the rejection of Lord Hardwicke's Bill, to record and mark the deep, light, and launching draught and displacement, in order to register the real tonnage and weight the ship could carry. It was submitted to the highest authority that this could be effected by modifying the present Act, so as to admit of the measurements being taken either externally or internally, by the addition to the 21st clause of rule No. 1, of the Act of 1850, for external measurement, and the formation of diagrams and curves of areas, and scale of displacement, as shown in the amended clauses appended. Lord Hardwicke's Bill was refused in the House of Lords, on the ground that "*four shipbuilders had decided against it, and that all consulted were in favour of the existing system.*" And as to my proposed amendment, it was intimated that the Board of Trade considered the tonnage of merchant ships only as a fiscal question, "to procure a test of the size of the ship, for the purpose of paying light, dock, and other dues;" and that the shipowners having made no complaint of the new measurement, the Board of Trade would not consider any alteration of the present system till urged by them or parliament took it up.

The proposition that "tonnage is a fiscal question" as to the payment of light or dock dues, and that shipowners not objecting to the new measurement should be any ground for refusing investigation, I consider merely as assumptions based on mistaken or erroneous premises, as I will endeavour to show. It is true the shipowners have taken little interest in the measurement for tonnage, their attention being occupied with the consolidation of 37 Acts of Parliament, their rights and responsibilities being infinitely more involved in alterations in the legal procedure, ownership, and government interference as to crew and passengers, extending over the other 538 clauses of the new Act, than in the 10 clauses defining the mode of measurement and record of register tonnage.

The old or builders' tonnage, though formerly used for customs duties on cargoes, and representing the statistics of the shipping and trade of the empire, the old as well as the register tonnage, have long ceased to be used for fiscal dues, customs duty being only levied on goods and cargo carried, and not upon the tonnage of ships.

Payments for the use of lights, docks, and harbours, cannot be considered as fiscal dues or government tax, the tonnage light dues being paid to the Trinity House for their maintenance, the surplus belonging to the Mercantile Marine Fund, managed by the Board of Trade. The harbour dues, as well as some dock dues on the tonnage of shipping, are paid to local public trusts, as at Liverpool, and some ports. At London, and other places, private docks and chartered companies receive tonnage dues for space, quayage, and safety. These dues only average from one to five shillings per ton, per voyage, for light and accommodation, which cannot be considered a burthensome tax on shipowners, or one likely to induce much inquiry, particularly as there is every prospect that, ere long, light dues will be much reduced, or altogether withdrawn, as in other countries.

For a century past the registry of shipping has been a department of the custom-house; the old tonnage is said to have originated in duty charged on cargoes of wine, the measurement being made by custom-house officers, and so various were the dues and charges levied on tonnage, that even the safety of our ships was endangered in order to evade it. The acts of 1835 and 1845 obviated many of these evils, but foreign nations having adopted a rule approximating to the old tonnage, the same was continued in use by builders, merchants, and even for government contracts.

The tonnage measurers consist of one or two subordinate officers at each custom-house, who merely give to the registrar the dimensions, particulars, and tonnage, by the rule defined in the act, but who take no cognisance of the form, materials, or strength of the ship, as is the case with district surveyors of houses. In some ports there are separate measurers of tonnage for the light and dock dues.

The decision of shipbuilders against the displacement tonnage, I consider an interested adhesion to the old and obsolete, or the register tonnage, natural enough, considering that ships are still built by the old register tonnage, both being so absolutely indefinite, as a measure of burthen or cost, that by builders' tonnage, a shallow, sharp ship may be built of half the burthen, with two-thirds of the materials of a deep, full ship of the same old tonnage. The opinion of established tonnage measurers of the custom-house in favour of the existing system is an interested view of effete forms, showing an adherence to routine of the worst description, only to be remedied by investigating the working of the new system.

Since May last, under the new Act, the custom-house established measurers remain, with the addition of Mr. Moorsom as surveyor-general of tonnage in London, and an assistant at one or two large ports. The measurements are taken according to a book of instructions by the measurers, and recorded in a formula or table (used for computing displacement by Stirling's rule) from which the areas are calculated, and the internal space computed by the measurer, the divisor 100 giving the tonnage on which the register is granted, a copy of this table of measurement being sent to the surveyor-general of tonnage at the central office in London. From a record of the measurements the surveyor can draw *detective curves* to ascertain the correctness of the measured distances by a curve run through them. These curves forming a diagram of each of the sections of the ship measured, by placing these at the recorded interval apart, a complete drawing of the internal form and lines of the ship is obtained, and by adding the thickness of the side, the external bulk, displacement, area of midship section, &c., forming a complete draught of the ship.

It must be seen that the fiscal dues, government taxes, and customs' revenues levied on shipowners, are now very small, so as hardly to pay the salaries of the separate custom house tonnage surveyors and measuring officers. At a very little more cost a descriptive measurement and displacement tonnage by experienced surveyors under the Board of Trade might be obtained, which would afford an amount of safety and efficiency, both for public and private interests, very far beyond a mere measurement of tonnage for custom-house dues.

The description of information which would thus be afforded will be found in the Table annexed to this paper, the first seven columns of which gives the dimensions, proportions, and sizes of vessels, from Noah's Ark to the modern ark now building in the Thames. The original type of ocean steamers, *Great Western* to the American *Susquehanna*, screw vessels *Great Britain* to *Victoria*, sailing clippers *Kelpie*, *Great Republic*, and iron clipper *Tayleur*, their proportions of length, which vary from less than four times to more than eight times their breadth, their depths which vary from 5-tenths to 9-tenths their breadth, and their sizes which vary from 350 tons to 23,000 tons—an extreme range—involving much consi-

deration to arrive at the happy medium, combining safety, efficiency, and economy.

The 13th and 14th columns contain the deep draught and displacement proposed in Lord Hardwicke's Bill, but objected to by the President of the Board of Trade, on the grounds (*as he was informed*) that "it was impracticable, and even if it could be carried into effect it would be useless." Now the practicability is proved by the fourteen vessels enumerated, and the usefulness is shown by the other columns, and in these, the one showing the weight of the hull being deducted from the one showing the displacement, will give the exact weight of cargo, armament, men, and provisions the vessel can carry, and the given draught of water, whilst the scale of tonnage, displacement, on the certificate of survey proposed, will show the weight of cargo at any draught, and would be useful to the government, merchant, purchaser, or charterer, as defining the capabilities of the ship contracted for. The 17th column, giving the fixed weight of engines, boiler, and water, must also be deducted from the load displacement (less weight of hull), for the weight of cargo and fuel the steamer can carry.

The 18th column contains the area of cross or midship section immersed in square feet, which, with the deep displacement, being the principal fixed and ascertainable elements of resistance, are recorded as the basis of relative steam power, cost, and speed realised. The speed given in knots and decimals are mostly the average realised by contract steamers on mail service, from 26,000 to 114,000 miles.

The term nominal horse-power used in the table being equally as indefinite as old or builders' tonnage, so ably explained by Mr. Atherton, I have left that question to his greater knowledge, experience, and scientific attainments, and have confined myself in this paper to the history of the tonnage question, my experience of the practical working of the new Act, and its numerous anomalies.

As much of the relative advantages of the different plans depend on the facilities and correctness of the measurements and computations, it is necessary to state the particulars of the present and proposed principle and mode.

The Rule No. 1 for *internal* measurement is computed by 15 to 60 breadths at 3 to 12 sections, and then a record in a tabular form, to facilitate the computations of the contents of the vessel by Stirling's rule in cubic feet, using the divisor 100 for the register tonnage, and thus approximating to the old tonnage. It is stated, "that any important errors in the result can easily be *detected* by drawing the figure of the ship, without the necessity of re-measurement; the tabular forms themselves remaining with the surveyor-general, the owner being furnished with a printed form of certificate of surveyor, with the description, dimensions, gross and register tonnage, for the seven forms of transfer, mortgage, &c.

The principles and mode I propose is an external measurement of 5 to 15 transverse sections of the length, some 20 to 100 breadths, recorded when measured on paper, ruled to a scale of square feet, marked by spots and figures on the scale and height, so that a curve may be run through these spots, and thus form a diagram of each section of the breadth; the curve also showing any mistakes in the first record, *preventing* errors in the computing the areas of sections, which set up on the scale will form the curves of areas, from which may be deduced, by Stirling's rule, the external bulk in cubic feet to the height of deck; the displacement at the deep and water line being ascertained by two other curves, the whole affording a *complete drawing of the form of the vessel*, whilst every measurement taken would be marked on the scale, and every figure used in the computation would be recorded on this CERTIFICATE OF SURVEY, which it is proposed to substitute for the tabulated formula recently used under the new Act, which formula contains the internal measurement of breadths, and their product, which is left in the hands of the surveyor-general.

I would observe that the present plan places in the hands of one or two professional surveyors, the designs, lines, and proportions of every measured or new ship entering British ports, or built by able or experienced builders, and this without any public object, as the surveyors of tonnage give no opinion except as to size or capacity for cargo, and the legal identification of the vessel, such as has heretofore been done by custom-house officers, the measurers not being experienced shipwrights or nautical surveyors. For all the purposes of the custom-house officers it would be sufficient to substitute the dimensions in the present certificate of surveyor, form A, for forms B and C, form of registry D, and other forms, E, F, G, H, I, the particulars before proposed to be recorded in the forms of transfer, mortgage, &c., taking as the legal identification of the ship the three qualities of bulk, space, and contents of hull in cubic feet.

It is proposed that the formula of measured distances now deposited with the surveyor-general for the forming of the *detective curves*, should be used for the measurement, taken in the presence of the builder and owner, and that the distances be set off on paper, ruled to a scale, thus at once forming a detective diagram or curve that will prevent any error in the measurements or levels before the tonnage is computed. The diagrams of each section being thus formed at the most convenient place for measurement, the scale on the paper becomes a more correct formula than the present for forming the curves of areas, and computing the bulk, space, and tonnage, and forming a scale of displacement and internal capacity, as well as information as to the proportion, resistance, and the section of the frame of the vessel, and thus (with specification of material) affording all the information that is necessary to Government, owners, insurers, merchants, or passengers. A copy of this to be made out in triplicate, signed by a Registrar, Government surveyor, and owner, and deposited at the port of registry, the Board of Trade, and with the owner, where it may be inspected and verified by the surveyors to Lloyd's Committee for the classification of vessels, whose book is now the only public record of the efficiency of British merchant shipping.

Throughout the various legislation on tonnage since 1828, all efforts have ended in confusion, simply because tonnage was originally based on error, and expedients have been adopted to suit the views of of different parties instead of simply seeking the truth. The result of this abortive legislation is the present confusion, there being now four different measurements for tonnage in use, as shown in the 7th, the 8th, the 9th, and the 11th columns of the table. The old or builders', the steamers' register, the late ships' register, and the new register tonnage, under Act, 1854, all alike indefinite as a measure of ships' cost or capabilities. So much is this the case, that ships are now sold by the ton, on a mean between the old and the new tonnage, they varying as much as ten and twenty per cent. in the same ship. A few months has shown numerous anomalies in the new internal measurement and clauses of the bill, Mr. Scott Russell having informed the Society of Arts that his new steamer built as 480 tons under late law, measured by the new act 543 tons. This may arise from the extraordinary provision of clause 23, reducing the tonnage of steamers even more than is shown in the 8th and 9th columns, the register and gross tonnage.

This is a public question, inasmuch as many steamers paying light and dock dues on their register or reduced tonnage, are hired as transports at 40 to 60 shillings per ton per month on the gross tonnage, government providing them with coals; their capacity for cargo being small, the cost must be so enormous, that millions of public money might have been saved, had there been the means of ascertaining their *capabilities for mercantile transport service*, and paying them accordingly.

The difficulties of measuring steamers at exact equal distant sections, has obliged a great many to be measured by rule No. 2. The Amended Act of 1855

merely authorises the payment of fees for re-measurement —probably the increased tonnage spoken of by Mr. Scott Russell may have led to this outlay by steam transports.

My proposal is, that by embodying in the present Act a clause B to the effect that the Rule 1 for external measurement of the Bill of 1850 be also added to the 20th and 21st clauses of the consolidated Bill, in the form shown in italics in the before-mentioned copy of clauses and rules or measurement and computation, which will be published hereafter.

I would suggest the expediency of the whole question of the descriptive measurement of ships and steamers, and the legalised unit of marine horse-power being referred by Government to a commission, during the recess, of public officers, scientific engineers, and practical nautical men.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 2nd August, 1855.

Par No.
140. Civil Services Estimates—Class 8.
413. Consuls, &c.—Return.
444. Colonial Bishops—Return.
435. East India (Torture)—Copies of Letters.
279. Bills—Limited Liability (as amended in Committee and on Re Commitment.)
280. Bills—Fisheries (British Islands and France) (amended.)
281. Bills—Public Health Act (1854) Continuance and Amendment.
283. Bills—Diseases Prevention.
284. Bills—Union of Contiguous Benefices (amended).
Railway Accidents (1st January to 30th June, 1855)—Return.
Births, Deaths, and Marriages—16th Report of the Registrar General.
Cape of Good Hope (Kaffir Tribes)—Further Papers.
Turkish Loan—Declaration exchanged between the British and French Governments.

Delivered on 3rd August, 1855.

407. Sale of Beer, &c., Act.—1st Report from the Committee.
431. East India (Annexation of Ihansi)—Correspondence, &c.
446. Militia Estimates—Report from the Committee.
230. Bill—Income Tax Elective Franchise.

Delivered on 4th August, 1855.

439. Civil Service Commission—Copy of Treasury Minute.
405. Barrack Accommodation for the Army—Report.
285. Bill—Coal Mines Inspection (amended by the Lords).

Delivered on 6th August, 1855.

333. New Palace (Westminster)—Return.
209. (1) Militia—Supplementary Return.
441. Civil Service (Number of Examinations)—Return.
442. Army Prize Money—Account.
452. Militia (Ireland)—Return.
221. Bills—Grand Juries (Ireland).
286. Bills—Navigation Works (Ireland) (amended).
287. Bills—Burials (amended).
288. Bills—Exchequer Bills (£7,000,000).
War with Russia (Loss of Officers and Men at Hango)—Further Letters.
Patents for Inventions—Report of the Commissioners.
Tariffs (Foreign Countries)—Return.

Delivered 7th August, 1855.

399. Army Clothing (Crimea)—Return.
290. Bills—Leases and Sales of Settled Estates (as amended by the Select Committee).
291. Bills—Burials (as amended in Committee and on Consideration).
292. Bills—Public Health (No. 2).

Delivered on 8th August, 1855.

281. Metropolis Sewers (Pipe Sewers)—Return.
438. Newspaper Stamps—Return.
451. Board of Ordnance and War Department, &c.—Returns.
293. Bills—Chinese Passenger Ships (as amended by the Lords).
294. Bills—Lunatic Asylums and Regulations Acts Amendment (as amended by the Lords).
265 Bills—Sale of Spirits (Ireland) (as amended by the Lords).

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette August 3rd*, 1855.]

Dated 23rd July, 1855.

1668. A. Achard, Chatte, near St. Marcellus, France—Application of electricity as a transmitting agent of motive power.

INVENTION WITH COMPLETE SPECIFICATION FILED.

1735. N. Brough, Birmingham—Clasps and buckles, 31st July, 1855.

WEEKLY LIST OF PATENTS SEALED.

Sealed August 3rd, 1855.

37. Jean Baptiste Edouard Ruttre, Paris—Improvements in the treatment of rags and other goods formed partly of wool and partly of vegetable fibres, in order to separate the vegetable fibres from them and obtain the wool in its pure state.
253. Frederick Samson Thomas, 17, Cornhill, and William Evans Tilley, 6, Kirby-street—Improvements in plating or coating metals.
266. Alexander Morton, Kilmarnock—Improvements in weaving carpets.
274. Deane John Hoare, 10, Salisbury-street, Strand—Improvements in propelling vessels.
296. William Hartfield, Prospect-row, Bermondsey—Making book covers, in tortoiseshell, inlaid or not with pearl or ivory, and for improvements in machinery for embossing, carving, and inlaying book covers with pearl and ivory, and for making metal joints by which such books may be widely opened, the said improvements to be applicable to inlaying pianofortes.
308. William Beckett Johnson, Manchester—Improvements in steam boilers and engines.
331. Auguste Vallery, Rouen—Improved machinery for the preparation of flax, hemp, and other textile materials.
336. John Raphael Isaac, Liverpool—Improvements in the construction of portable buildings.
346. Christophe François Delabarre, Paris—Improved apparatus to be used in propelling gases and forcing liquids.
407. Nathan Thompson, jun., New York—Improvements in constructing life boats.
709. William Tytherleigh, Birmingham—The application of a certain well-known process to the covering of iron in sheets or bars with copper or copper alloys, whereby he produces a new and useful product.
726. Elizabeth Abbott and Matilda Abbott, Horningsea, Cambridge —Improvements in stays.
905. John Orr and James Templeton, Glasgow—Improvements in the manufacture of figured fabrics.
963. James Marsh, 13, Store street, Bedford-square—Improvements in the construction of pianofortes for rendering them more portable.
967. William Johnson, 47, Lincoln's-inn-fields—Improvements in regulating the pressure or flow of gas or fluid bodies. (A communication.)
1091. Robert Stirling Newall, Gateshead—Improvements in apparatus employed in laying down submarine electric telegraph wires.
1140. Antoine Fidelis Cossus, Cagliari, Sardinia—Improvements in treating oils and fatty matters.
1141. William Longmaid, Victoria cottage, Stoke Newington, and John Longbottom, Leeds—Improvements in heating coppers, pans, and boilers.
1142. Joseph Louis Rey and Adolphe Guibert, Marseilles—A composition to preserve wood and iron, called, 'a submarine and preserving coating.'
1152. John Cruickshank, Marcassie, Elgin, N.B.—An improved construction of offensive and defensive equipment of cavalry.
1160. Francis Leeshing, Busby, near Glasgow—An improved method of preparing or treating certain dye-stuffs, so as to obtain greater dyeing power.
1161. David L. Davis, Dedham, Norfolk, Massachusetts, U.S.—An improved method of applying elastic bearings to railroad chairs and rails.
1174. Silas Safford Putnam, Massachusetts, U.S.—A new or improved forging machine.
1175. Samuel Edwin Robbins, Vermont, U.S.—Improvements in fire arms. (Partly a communication.)
1229. Thomas Vincent Lee, Prospect cottage, Dulwich—Improvements in generating steam in marine and other boilers.
1256. Richard Whytock, Edinburgh—Improvements in colouring yarns or threads intended to form elements of various loom fabrics and for crotchet work and knitting.
1280. David Newell Brown Coffin, jun., Massachusetts, U.S.—A new and useful improvement in self-closing stop cocks.
1282. Cyrus Curtice, Massachusetts, U.S.—A new and improved light alarm or burglar annunciator, or apparatus to give alarm when a burglarious attempt is made to enter a room or dwelling.
1284. Ethan Allen, Massachusetts, U.S.—An improved breech-loading fire-arm.
1300. John Buncle, Springfield, Linlithgow, N.B.—An improvement in bleaching résinous substances (calophane) for the manufacture of soap.

Sealed August 7th, 1855.

307. John Lees, Park-bridge Iron Works, Ashton-under-Lyne, and William Heap, Ashton-under-Lyne—Improved machine or apparatus for cutting and straightening bars of metal.
328. John Foster, Long Eaton—Improvements in machinery for the manufacture of lace.
365. Richard Archibald Brooman, 166, Fleet-street—Improvements in the manufacture of capsules for stopping or covering bottles, jars, and other similar vessels, and in the machinery employed therein.
375. Jean Wothly, Zoffingen, Switzerland—Improvements in the preservation of meat.
391. Thomas Harrison, Hackney—A composition for covering and protecting the bottoms of ships and vessels.